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Social Sciences

7310 Economics
INSTRUMENTAL PRICE ESTIMATES AND RESIDENTIAL WATER
DEMAND
C. F. Jones (Economic Data Resources, Boulder,
Colorado 80521); J. A. Moxley
Instrumental estimates of two price specifications,
one motivated by the common decision problem given
full information about rates and charges and the
other, an average price estimation, are developed to
correct for measurement error when residential water
consumption is measured as a schedule of rates, rather than at
uniform prices. Annual water purchases of single
family residences are regressed on these instrumental
price estimates, family income, and household size by
ordinary least squares, based on a sample of 316
observations from metropolitan Denver, Colorado, for
1979. The resulting demand estimates are robust to
the price measure specified, and are consistent
with findings in the literature. The overall price
elasticity estimates range between -0.14 in a linear
model to -0.42 in a nonlinear model, while the
elasticity estimates range between 0.40 and
0.55.
Water Resour. Res., Paper 3H1867

7340 General (Water Resources Planning)
SUSTAINABILITY OF COUNTRIES BY GROUP PROCESSING IN
THE MEDITERRANEAN
J. P. Daux (Office of the Assistant Secretary of the
Army for Civil Works, 20 Massachusetts Avenue, N.W.,
Washington, D.C. 20561), and K. P. V. V. V.
A weak link in previous attempts to apply
multicriteria decision-making tools to actual
decision problems was the lack of a systematic
method to select the most appropriate criteria for
this difficult problem. This paper presents a
group process to develop a suitable procedure for
generating and structuring issues. The procedure,
in turn, is applied to determine a set of
criteria for the selection of a portfolio of
water projects. The procedure involves a series of
iterations of a set of objectives which is minimal,
operational, complete, decomposable, nonredundant,
and hierarchically structured. (See also 7340, 7341,
7342, 7343, 7344, 7345, 7346, 7347, 7348, 7349, 7350,
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News (cont. from p. 977)

ganic compound in crude oils and oil shales, but until this recent study, existence of the compound has remained unconfirmed. Treibs' scheme detailed the formation of the porphyrin from chlorophyll. The steps of porphyrin formation could characterize the biological origin of petroleum, but the very crucial piece of evidence has been lacking. The apparent difficulties of extracting an adequate single crystal without suffering chemical decomposition were overcome in a multistep process. The extraction was accomplished with a sample of oil shale from the Julia Creek Deposit in North Queensland, Australia. X-ray diffraction analysis yielded a monoclinic cell ($P2_1$) with $a = 12.912 \pm (3)$, $b = 14.151 \pm (4)$, and $c = 18.404 \pm (8)$, $\beta = 70.34 \pm (2)$. The structure refinement completed with a residual of 0.077. The crystals were found to have the vanadyl C_{50} DPEP structure, which was proposed by Treibs in 1934.

According to the CSIRO group: "The result is important because it represents the first complete identification of a petroporphyrin unlikely to have been chemically altered by the extraction procedure. More importantly, however, the determination of this structure confirms, for the first time, the long-held belief that petroporphyrins are derived from chlorophyll." The results substantiate Treibs' hypothesis, which is accepted as the foundation for organic geochemistry.—PMB

Artificial Coal

The geology and geochemistry of coal are receiving increased attention in federal government laboratories. Coal may be burned at increasing rates for centuries to come, and thus its properties must be better known. A new approach to coal research was reported recently by investigators at the Argonne National Laboratory (Chemical and Engineering News, November 21, 1983). A group from Argonne's Division of Chemistry has recently synthesized coal from natural materials. The results of this study may provide insight to the nature of the highly complex organic structures that are found in coal. Clearly, the goals of the Argonne program to characterize coal chemically and to document the geological processes of its formation are closer to being realized than ever before.

There may be numerous geologic processes involved in the formation of coal deposits. Plant material is thought to undergo biogenic alteration in nature before it is metamorphosed into coal, but the new Argonne results may dispute this. In the artificial coalification experiments, lignin was converted directly to lignite by a clay-catalyzed process. The geological analogue would be the slight alteration of wood, with the loss of hydrocarbons, followed by the formation of coal macromolecules at relatively low temperatures (150°-200°). Natural clays could act also to catalyze the reaction.

The study is only beginning, but the early findings have been intriguing samples of what may be expected. The suggestion is that lignins and other similar materials may survive sedimentary diagenetic processes; indeed, they may be relatively pure products. If so, they could be converted directly to coal molecules in relatively short time periods (months) by naturally catalyzed reactions.—PMB

Hubble Space Telescope

The Space Telescope, scheduled for launch aboard the Space Shuttle in 1986, has been renamed the Edwin P. Hubble Space Telescope, the National Aeronautics and Space Administration (NASA) announced. The orbiting optical astronomical observatory will carry a 2.4-m mirror and five scientific instruments that will be able to look into space 7 times farther than any ground-based observatory. NASA expects the resolution of the resulting images to be 10-20 times better than images from ground-based instruments. Hubble probably is best known for his discovery, with colleague Milton Humason, that the universe is expanding. Hubble confirmed that the faint, spiral nebulae viewed through the Mount Wilson Observatory's Hooker Telescope were distant systems receding from us at velocities proportional to their distances. Hubble was a staff member at Carnegie Institution's Mount Wilson Observatory near Pasadena, Calif., from 1919 until his death in 1953.

Geophysicists

Charles A. Barth, director of the Laboratory for Atmospheric and Space Physics at the University of Colorado, Boulder, recently was awarded the National Aeronautics and Space Administration's medal for distinguished public service. Barth was cited for his "outstanding leadership and contributions in proposing and establishing the Solar Mesosphere Explorer (SME) project" as well as his personal dedication that has helped make the SME a "highly successful scientific mission."

Recent Ph.D.'s

For periodically lists information on recently accepted doctoral dissertations in the disciplines of geophysics. Faculty members are invited to submit the following information for publication, on institution letterhead, above the signature of the faculty advisor or department chairman:

- (1) the dissertation title
- (2) author's name
- (3) name of the degree-granting department and institution
- (4) month and year degree was awarded.

If possible, include the current address and telephone number of the degree recipient (this information will not be published).

Rock Magnetism and Paleomagnetism of Miocene Fluvial Sediments in Northern Pakistan. Lisa Tauxe, Dept. of Geological Sciences, Columbia Univ., January 1983.

Seismic Hazards Evaluation in Interplate and Intraplate Environments. Stuart P. Nishenko, Dept. of Geological Sciences, Columbia Univ., January 1983.

Seismic Velocities and Attenuation in a Heated Underground Granitic Repository. Bjorn N. P. Paulsson, Dept. of Materials Science and Mineral Engineering, Engineering Geoscience, Univ. of California, Berkeley, January 1983.

Geochemistry of Haleakala Volcano, East Maui, Hawaii and Implications for the Evolution of Hawaiian Volcanos. Chu-Yung Chen, Dept. of Earth, Atmospheric and Planetary Sciences, MIT, February 1983.

High Temperature Deformation of Hot-Pressed Polycrystalline Orthostaurolite. A. Delghian, Dept. of Materials Science, Univ. of Southern California, February 1983.

Energetics of Ions by Oblique Double Layers. Marian Elizabeth Greenspan, Physics Dept., Univ. of California, San Diego, April 1983.

Geologically-Developed Probability Seismic Risk Analysis. Hui-Yuan Liang, Dept. of Geological Engineering, School of Mines & Metallurgy, Univ. of Missouri-Rolla, May 1983.

High Latitude Field Currents. Janice L. Karty, Dept. of Space Physics and Astronomy, Rice Univ., May 1983.

Reliability, Resilience and Vulnerability in Reservoir Operation. Wei-See Moy, Dept. of Geography and Environmental Engineering, Johns Hopkins Univ., May 1983.

Sismotectonics of British Columbia. Garry C. Rogers, Dept. of Geophysics and Astronomy, Univ. of British Columbia, May 1983.

Theoretical and Field Studies of Fluid Flow in Fractured Rocks. Paul Anthony Hsieh, Dept. of Hydrology and Water Resources, Univ. of Arizona, May 1983.

The Lithomechanical Properties of the Continental Lithosphere. Gary D. Karner, Dept. of Geological Sciences, Columbia Univ., June 1983.

Geochemistry of Boninites and Other Low TiO_2 Island Arc Volcanic Rocks. Rosemary L. Hickcy, Dept. of Earth, Atmospheric and Planetary Sciences, MIT, June 1983.

Geochemistry of the Preston Caldera of Southeastern Connecticut. Alfred D. Walker III, Dept. of Geological Sciences, Lehigh Univ., June 1983.

Laboratory and Field Investigations of the Processes Controlling Gas Exchange Across the Air-Water Interface. Blayne A. Hartman, Dept. of Geological Sciences, Univ. of Southern California, June 1983.

Petrochemical Evolution of High Cascade Volcanic Rocks in the Three Sisters Region, Oregon. Scott S. Hughes, Dept. of Geology, Oregon State Univ., June 1983.

Reservoir Operating Rules Generated by Deterministic and Stochastic Optimization. Mohammad Karamouz, School of Civil Engineering, Purdue Univ., June 1983.

230Th/238U Disequilibrium Systematics in Young Volcanic Rocks. Sally Newman, Scripps Institution of Oceanography, Univ. of California, San Diego, June 1983.

Three-Dimensional Magnetotelluric Interpretation. Philip E. Wannamaker, Geology and Geophysics Dept., Univ. of Utah, June 1983.

Wave and Particle Observations Associated with the Beam Plasma Discharge in a Space Simulation Chamber. William F. Denig, Dept. of Physics, Utah State Univ., June 1983.

Approximate Analytical Solutions for Modeling Subsurface Flow. Andrzej Banikiewicz, Dept. of Civil Engineering, Virginia Polytechnic Institute and State Univ., August 1983.

Diagenesis and Reservoir Qualities of the Jurassic Navajo (Nugget) Sandstone in Utah and Southwestern Wyoming. Kadir Uygur, Geology and Geophysics Dept., Univ. of Utah, August 1983.

Propagation of Weakly-Nonlinear Surface Water Waves in Regions with Varying Depth and Current. James T. Kirby, Jr., Dept. of Civil Engineering, Univ. of Delaware, August 1983.

Unsteady Flow Simulation of Rivers with an Ice Cover. Poogilho N. D. Yapa, Dept. of Civil and Environmental Engineering, Clarkson College, August 1983.

Crustal Structure and Seismicity of the Washington Continental Margin. J. John Taber, Geophysics Program, Univ. of Washington, September 1983.

Morning Twilight Observations of the Zodiacal Light and Terrestrial Airglow. Richard P. Cebula, Johns Hopkins Univ., Dept. of Physics, September 1983.

Hydrographic Variability in the Western North Atlantic Ocean from the POLYMODE Local Dynamics Experiment. Eric J. Lindstrom,

School of Oceanography, Univ. of Washington, October 1983.
Magnetotelluric of Neogene Quaternary Siliciclastic Group Sediments of the Trans-Indus Salt Range, Northwestern Pakistan. Mohammed Javed Khan, Dept. of Geological Sciences, Columbia Univ., October 1983.
Short-term Forecasting of Municipal Water Use. Roland Steiner, Dept. of Geography and Environmental Engineering, Johns Hopkins Univ., October 1983.

Books

Deposition of Atmospheric Pollutants

H. W. Georgii and J. Pankratz (Eds.), D. Reidel, Boston, ix + 217 pp., 1982, \$37.

Reviewed by L. M. Malet

Deposition of Atmospheric Pollutants, containing the proceedings of a colloquium held at Oberursel/Taunus, FRG, November 9-11, 1981, is divided into three main parts: dry deposition; wet deposition; and deposition on plants and vegetation.

The 30 articles in the volume permit a fair survey of present-day knowledge and will be a useful tool to all working on the topic. Pollution by deposition of either the dry or wet sort is very insidious; its importance only appears in the long range, when its effects are or are almost irreversible. That is why concern was so long in emerging from decision makers.

Two maps reproduced in the contribution by H. W. Georgii (pp. 56 and 57) show the global distribution of the acidity in precipitation (pH data since 1972) determined owing to the WMO-BAP-mon network data: they are quite expressive and in a certain way chilling, mainly for Europeans and, above all, for those living around the Baltic and North seas (pH between 4 and 5). Other graphs given in the same article show no significant trends in "acid rain" between 1972 and 1979. Acidic precipitation should certainly be one of the main subjects of environmental science in the near future.

Looking at the five articles which deal with dry deposition, it is clear that deposition velocity of particles is the main concern. Three types of approach emerge: (1) tunnel experiments; (2) modeling under a certain number of assumptions of fact and, unfortunately, a greater number of assumptions; and (3) field experiments on short or long term.

The model of Schmitz and Hogson, for instance, which is used in one of the contributions, implies that surface elements should have small roughness heights only; that particle flux is constant; that particle diffusivity can be determined; that the effect of gravity can be defined; that particle agglomeration does not occur; and that particles are completely retained by the surface. All these limitations and conditions are seldom found altogether in field experiments, which are by far the most complicated and interesting. Nevertheless, the model shows that deposition velocity decreases with increasing reference height, increases with increasing roughness height, and increases with increasing friction velocity.

When comparing results obtained using one or the other of the three methods, it is not astonishing at all that differences of one order of magnitude and even more are found. The field of research in this domain is still quite open; it is evident that systematic, long-term experiments should be made over a variety of terrains and under a variety of meteorological conditions before we come to more realistic conclusions.

All articles are followed by a good, up-to-date bibliography.

L. M. Malet is with the Atmospheric Diffusion and Pollution Group of the Royal Meteorological Institute, 1180 Brussels, Belgium.

Analysis and Interpretation of Magnetic Anomaly Observed in North-Central California. JoAnne L. Huppington, Dept. of Geophysics, College of Oceanography, Oregon State Univ., November 1983.
The Interaction of Short Gravity Waves with the Gulf Stream, Shou-Ming Hwang. Dept. of Marine, Earth, and Atmospheric Sciences, North Carolina State Univ., December 1983.

Books

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POSITIONS AVAILABLE

Geophysicist or Tectonophycist/University of Kansas. KU seeks applications for a tenure-track faculty position in geophysics. Candidates should have research interests in crustal geophysics. The successful applicant will be expected to teach undergraduate and graduate geophysics courses, develop an active research program, advise students, supervise graduate student theses and dissertations, and provide service through administrative and professional activities. A Ph.D. in geology with specialization in geophysics is required although applicants who will complete the Ph.D. within the first year of employment at KU will be considered. The position is at the assistant professor level with a salary commensurate with qualifications. The starting date is August 16, 1984 and the application deadline is February 1, 1984. Send vita, transcripts, a brief statement of research interests and courses the applicant is qualified to teach, and three letters of reference to G. H. Girty, Department of Geology, University of Kansas, Lawrence, Kansas 66044. The advertisement position is contingent on continued state funding. For additional information contact G. H. Girty or phone (913) 884-4974.

KU is an affirmative-action, equal-opportunity employer. Applications are sought from all qualified people regardless of race, religion, color, sex, disability, veteran status, national origin, age, or ancestry.

University of Wisconsin-Madison/Tenure Track Position. The Department of Geology and Geophysics invites applications for an anticipated research position at the assistant-professor level in applied geophysics and hydrogeology commencing in August 1984. The applicant should be committed to developing a strong research program with teaching undergraduate courses in some areas of engineering and environmental geology.

The Ph.D. is required. Applicants with course work in geophysics and an interest in the field application of geologic principles are especially encouraged.

Send letter of application outlining your professional goals, transcripts, resume, copies of publications, and three letters of reference to Dr. David M. Johnston, Department of Geology and Geophysics, 550 Hall, University of Wisconsin, Madison, WI 53706.

The University of Wisconsin is an equal-opportunity/affirmative-action employer.

EOS

Transactions, American Geophysical Union

The Weekly Newspaper of Geophysics

For special treatment of contributions send three copies of the double-spaced manuscript in one of the editors' names below and one copy to AGU.

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For advertising information, contact Robin E. Little, advertising coordinator, toll free at 800-424-2488 or, in the D.C. area, 462-6903.

Ohio State University/Mineralogist. The Department of Geology and Mineralogy invites applications for a tenure track position in mineralogy or petrology. The successful applicant will be expected to interact with other members of the faculty in the fields of mineralogy, petrology, geochemistry, and economic geology.

A Ph.D. or equivalent is required. The successful applicant will be expected to teach graduate and undergraduate courses, conduct research, and supervise graduate students. Rank and salary will be commensurate with experience and research record.

Dr. David H. Ellis, Chairman, Search Committee, Department of Geology and Mineralogy, The Ohio State University, Columbus, OH 43210.

Applications should include resume, statement of research record and interests, and the names of at least three persons who can provide recommendations. The closing date for applications is December 31, 1983; the appointment will be effective on later than October 1, 1984. Additional information can be obtained by writing or calling (614) 292-4531.

The Ohio State University is an equal opportunity/affirmative action employer.

Post-Doctoral Position/Naval Postgraduate School. The Ocean Turbulence Laboratory has available a post-doctoral position for a person interested in the analysis and interpretation of oceanic turbulence data. The tenure is for 1 or 2 years. The successful candidate should have a Ph.D. in physical oceanography and although experience with turbulence data is a preference it is not essential. The opportunity for involvement in data gathering expeditions is also available.

Resumes can be sent to Dr. R. G. Lueck, Code 681, Naval Postgraduate School, Monterey, CA 93943.

The Naval Postgraduate School is an Equal Opportunity/Affirmative Action Employer.

Faculty Research Positions/University of Maryland Institute for Physical Science and Technology.

The University of Maryland Institute for Physical Science and Technology is a research institute with open professional positions at all ranks in several areas including atomic and molecular spectroscopy and structure, VUV physics, laser plasmas, laser-matter interactions, laser light scattering, nonlinear optics of gases, condensed matter physics, statistical physics, astrophysics, optics and spectroscopy, solar probing for meteorology and air pollution, theoretical and experimental space physics, electron-molecule scattering, applied mathematics, numerical analysis, dynamical systems and chaos, and the history of science and technology. It is anticipated that one or more faculty appointments, either part or full time, will be made in the coming year in the above or closely related areas. Please direct inquiries to Professor J. R. Dorfman, Director, I.P.S.T., University of Maryland, College Park, MD 20742.

The University of Maryland is an equal opportunity/affirmative action employer.

Geophysicist or Hydrogeologist/NUS Corporation.

With responsible experience in the application of geophysical equipment at hazardous waste disposal sites or groundwater investigations. Most projects will be throughout the eastern U.S. with the home office located in Pittsburgh, Pa. Excellent opportunities for growth. Send resumes to attention of Nancy C. Davis, Personnel Administrator, NUS Corporation, Park West Two, CH2M Mine Road, Pittsburgh, PA 15275.

Equal Opportunity Employer.

Scientist GC/MS

Permanent position with major contractor in one of the country's leading geoscience laboratories at NASA's Johnson Space Center. Duties include:

- Performing basic research in the area of light element analysis (H, C, N, S, O) of terrestrial and extraterrestrial materials.
- Determining abundances and distributions of light elements and simple compounds in geological samples.
- Developing analytical techniques using the principles of gas chromatography, mass spectrometry, specific element analysis, ion selective electrode measurements. Volatiles are released from samples using the techniques of laser drilling, pyrolysis, crushing and combustion.

Prefer MS or PHD in analytical chemistry or geochemistry and familiarity with the following instrumentation: gas chromatography, mass spectrometry, data and control systems for GC/MS, electronic troubleshooting. Salary commensurate with qualifications.

Please send resumes to: F. M. Bond, Lockheed Engineering and Management Services, Co., B07-EOS 1816 Space Park Dr., Houston, TX 77258 or call K. V. Rodgers at (713) 483-4757. An EEO/AA employer.

Lockheed Engineering and Management Services Company, Inc.

AN EQUAL OPPORTUNITY EMPLOYER M/F/H

Microprobe Technician/South Dakota School of Mines and Technology. Applications are invited for a position as microprobe technician for the Institute for the Study of Mineral Deposits. The microprobe is an ETEC (MAC-5) with 3 spectrometers for X-ray emission and a quantitative PCT with depth study of stratiform gold deposits in the Black Hills. ISMD has a fully automated (WDS + EDS) microprobe and a new state of the art automated atomic absorption spectrometer with inductively coupled plasma torch (AAS/ICP) for major, minor and trace element analysis. Arrangements are in place for neutron activation analysis (Battelle, Richland, Washington) and light stable isotope analysis (U.S.S.).

Candidates for the position should send resumes and three letters of recommendation to:

J. J. Papke, Director, ISMD

South Dakota School of Mines and Technology

600 East St. Joseph Street

Rapid City, South Dakota 57701-3905

For additional information, call (605) 394-6182.

SDS&T is an affirmative-action/equal opportunity employer.

The Naval Postgraduate School is an equal opportunity employer.

Naval Postgraduate School, Faculty Positions/Meteorology. The Department of Meteorology, Naval Postgraduate School, invites applications for a tenure-track and a non-tenure track position and the Assistant or Associate Professor level. The positions are for persons whose teaching and research interests are in the fields of remote sensing and synoptic meteorology. The successful applicants will teach graduate and undergraduate courses and will be expected to develop an active research program that complements higher teaching. Rank and salary will be commensurate with the experience and qualifications of the successful applicants. Send a resume, names and addresses of three references, and a statement of academic and research interests, including availability for a non-tenured position, by 31 Dec 1983 to Professor R. J. Raper, Chairman, Department of Meteorology, Naval Postgraduate School, Monterey, California 93943. (Area code 408-646-2516/7).

The Naval Postgraduate School is an equal opportunity employer.

Carnegie Institution of Washington/Postdoctoral Fellowships 1984-1985. Department of Terrestrial Magnetism. Endowed postdoctoral fellowships in physical oceanography and atmospheric research in areas of seismology, geophysics, isotope and trace element geochemistry, cosmochemistry, accelerator mass spectrometry, planetary and solar and planetary formation. Renewable for second year. Completed applications due February 1, 1984. For information write Fellowship Committee (1), Dept. of Terrestrial Magnetism, Carnegie Institution of Washington, 5241 Broad Branch Road, N.W., Washington, D.C. 20015.

Women and minority candidates encouraged. Carnegie Institution of Washington is an EOE/AEE.

University of Washington/Postdoctoral Position. Research Associate (postdoctoral) with background in physical oceanography and atmospheric research in areas of seismology, geophysics, isotope and trace element geochemistry, cosmochemistry, accelerator mass spectrometry, planetary and solar and planetary formation. Renewable for second year. Completed applications due February 1, 1984. For information write Fellowship Committee (1), Dept. of Terrestrial Magnetism, Carnegie Institution of Washington, 5241 Broad Branch Road, N.W., Washington, D.C. 20015.

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DIRECTOR

Oklahoma State University Water Research Center

Responsibilities include:

- Implement and coordinate programs of the Water Research Center.
- Work with state and federal agencies to identify needs and opportunities in water resources, research and education.
- Work cooperatively with the deans and research directors of the seven academic colleges at OSU.

Training and Experience

- A Ph.D. degree with several years' experience in water resources is highly desirable.
- Successful development of contract and grant programs and excellent communicative skills are essential.
- Research administration and graduate level teaching experience are desired.

Salary: Commensurate with qualifications.

Academic Rank: Commensurate with academic training and professional experience. Although the director's position is not a tenure-track appointment, there is the possibility that the director can be appointed to a tenure-track position within an appropriate academic department. This would require approval of the department and appropriate dean.

Applications: Applications will be received until March 1, 1984. Send letter of application, resume, transcripts and a list of three (3) references to:

Dr. W. A. Sibley
Oklahoma State University
101 Whitehurst Hall
Stillwater, Oklahoma 74078

OKLAHOMA STATE UNIVERSITY IS AN EQUAL OPPORTUNITY EMPLOYER

Metecology/Department of Commerce, National Oceanic and Atmospheric Administration (NOAA). The Office of Climate and Atmospheric Research, Office of Oceanic and Atmospheric Research, NOAA, announces a vacancy for the position of Meteorologist, GS-1340-19/14, Rockville, Maryland. Vacancy closes January 12, 1984. Incumbent will plan, coordinate and implement research programs from mesoscale to climate applications, with special emphasis on satellite data collection, data management and follow-on research activities. Serves as focal point within NOAA for data management and evaluation of research activities associated with and evaluates research proposals for such programs as First GARP Global Experiment (FGGE) and Tropical Ocean and Global Atmosphere (TOGA) Program. Allocates funds for research contracts and grants. Persons interested in applying MUST request a copy of Vacancy Announcement by writing to NOAA, 6001 Executive Boulevard, Rockville, MD 20852, Attn: V. Peters, AFPER11 or calling (301) 445-8975. Applications should be submitted on Standard Form 171, Department of Commerce is an equal opportunity employer.

Physical Oceanography and Acoustic/Dynamics Technology, Inc. Research Scientist positions are available for versatile and innovative individuals with capabilities in the following areas:

Ocean Acoustics and Signal Processing. Candidates at both entry and experienced levels are sought. Analytical and experimental positions are available in the fields of acoustics, hydroacoustics and geophysics. Remote sensing and image processing. Ph.D. or M.S. required. Salary commensurate with experience.

Physical Oceanography, Ph.D. or some experience preferred. Positions involve both analytic modeling and analysis of small-scale hydrodynamic processes in the ocean. Experience with internal waves, fine structure or microstructure is desirable. Submit resume and salary requirements to: Fern Marks, Manager of Administration, Dynamics Technology, Inc., 22999 Hawthorne Blvd., Torrance, CA 90505.

Equal Opportunity Employer M/F-U.S. citizenship required.

Geophysics-Tectonophysics/University of Wyoming. Applications are invited for a tenure track position at the Assistant Professor level in the Department of Geology and Geophysics. Candidates should have teaching and research interests in such areas as tectonophysics, thermal modeling and/or plate tectonics. The successful applicant will join an established Ph.D. level geophysics program. Duties will include teaching undergraduate and graduate level geophysics courses, and establishing a vigorous research program. Excellent opportunities exist for cooperation with mathematicians; the Mathematics Department includes a strong numerical methods group with interests in geophysics. Send resume, transcripts and three letters of recommendation to: January 15, 1984 to Peter N. Shive, Dept. of Geology/Geophysics, P.O. Box 3100, University of Wyoming, Laramie, WY 82071. The University of Wyoming is an equal opportunity/affirmative action employer.

McMaster University/Department of Geology-Geophysics. Applications are invited for a tenure-track position in Geophysics. The department has established strengths in geochemistry (including isotopic studies), sedimentology and stratigraphy, and is seeking to develop into areas of solid earth geophysics relevant to existing geological research programs. Teaching duties will include a course in applied geophysics for geology students and participation in a joint Geology/Physics Program. The appointment should be made before September 1984 and will probably be at the Assistant Professor level. In accordance with Canadian immigration requirements, priority will be given to Canadian citizens and permanent residents of Canada. Those interested should submit a curriculum vitae and the names of three references to:

Dr. M.J. Rusk, Chairman, Appointment Committee, Department of Geology, McMaster University, Hamilton, Ontario, Canada L8S 4M1.

Global Weather Dynamics, Inc./Computer Specialist. Location: National Meteorological and Environmental Center (NMEC) within the Meteorological and Environmental Protection Administration (MEPA), Jeddah, Kingdom of Saudi Arabia.

Academic Qualifications: Master of Science preferred with major in Meteorology and/or Computer Science. Appropriate types and duration of experience may be acceptable in lieu of academic qualifications.

Experience: Extensive computer experience including responsibility for data base design, development and implementation together with experience in data base management preferably using Control Data Corporation (CDC) computer systems. Experience in writing requirements documents and demonstrated advanced COBOL and FORTRAN programming skills are essential. Experience in file-handling applications and database systems. Experience with CDC operating systems and file management. Experience in Meteorology including data quality control and familiarity with archiving procedures in a major meteorological and/or climatological center desirable. Evidence of a broad interest in the environmental sciences would be an additional advantage.

Duties: The appointee will report to the Assistant Director in the School of Forest Resources. Primary responsibility for the design, development and implementation of the digital climatological and environmental data base. He will be responsible for maintaining a Saudi Arabian climate data base. He will also be required to liaise effectively with the Data Base Meteorologist, Quality Control Meteorologist and Environmental Specialist in the course of carrying out the Data Base Development Program and with the computer center staff in day-to-day operations.

Send resumes to:

Global Weather Dynamics, Inc.
2400 Garden Road
Monterey, California 93940
Attention: Mr. J. Adams
Telephone: (408) 649-4500

Global Weather Dynamics, Inc. is an Equal Opportunity/Affirmative Action Employer.

Geophysicist, Tectonophysics/Georgia Tech. The School of Geophysical Sciences at Georgia Tech invites applications for a faculty appointment in Earth Sciences. Applicants must have a strong understanding research potential demonstrated by several years of postdoctoral experience or a well-established research record, and experience in securing research funding. Although no field or oceanographic experience is excluded, preference will be given to candidates with a background in geophysics/tectonophysics.

The School of Geophysical Sciences has an expanding and active research program in many areas of Earth and Atmospheric Sciences. The School has 23 full-time faculty members and over 50 graduate students. Applications including resumes, phone numbers, and the names and addresses of at least three references should be submitted to Jean-Claude Marchal, Chairman, Geophysics Search Committee, School of Geophysical Sciences, Georgia Institute of Technology, Atlanta, GA 30332.

The Georgia Institute of Technology is a unit of the university system of the State of Georgia. Georgia Tech is an affirmative action/equal opportunity employer.

AGU Congressional Science Fellowship. Individuals who are AGU members and U.S. residents are invited to apply for a 1-year assignment on the staff of a congressional committee or a House of Representatives. The fellowship is an honor on a wide range of scientific issues affecting public policy questions.

Applicants should have a broad background in science; be articulate, literate, and flexible and be able to work well with people from diverse professional backgrounds.

A public policy background is not required, although such experience and/or a demonstrated interest in applying science to the solution of public problems is desirable.

\$28,000 plus travel allowances.

How to apply: Applicants should submit a letter of intent, a curriculum vitae, and three letters of recommendation. The letter of intent should include a demonstration of why the fellowship is desired, how you will qualify for it, what issues and congressional situations interest you, what role you envision as a congressional staff member, and what outcome you hope for in relation to career goals. The individual must also request letters of recommendation should discuss your professional competence and other aspects of your background that make you particularly qualified to serve as a Congressional Science Fellow.

Send your application to: Department MP, Congressional Science Fellowship, American Geophysical Union, 3000 International Avenue, N.W., Washington, DC 20008.

Application deadline: March 31, 1984.

The University of Illinois is an Affirmative Action/Equal Opportunity Employer.



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E10293

Climatologist-Postdoctoral Research Scientist/Lamont-Doherty Geological Observatory of Columbia University. Individual should be interested in climate variations over the past several centuries. Tree-ring data and climate reconstruction are available or under development for assembling into areal studies and analyses of climate dynamics. The long-term data is to be used in studying various forcing phenomena and regional variations. Experience in data analysis and knowledge of programming in FORTRAN and BASIC will be extremely useful. Applicant should have a strong commitment to research and anticipate being involved in preparation of papers and proposals.

Send letter of application, resume and names of at least three references by 10 January 1983 to:

Gordon C. Jacoby
Tree-Ring Laboratory
Lamont-Doherty Geological Observatory
Palisades, New York 10964

Position is a one-year appointment with possible second-year renewal.
Columbia University is an Affirmative Action/Equal Opportunity Employer.

Hydrogeologist/University of Illinois at Urbana-Champaign. The Department of Geology has re-instituted its search for a hydrogeologist to fill a permanent, tenure-track faculty position. The appointment will be at the Assistant Professor level. Salary is negotiable. A Ph.D. is required. Starting date will be August 21, 1984. The successful candidate will have a demonstrated background in one or more of the following areas of hydrogeology: basic analysis, flow in porous media, or chemical interactions between groundwater and rock and will be expected to teach one or more graduate courses in hydrogeology, to participate in our undergraduate instructional program, and to maintain and enhance our existing strong research program in hydrogeology. For equal consideration, application including the names of three references should be sent by February 1, 1984 to:

Professor R. James Kirkpatrick
Department of Geology
245 Natural History Building
1301 West Green Street
Urbana, IL 61801
Ph. (217) 355-3542

The University of Illinois is an Affirmative Action/Equal Opportunity Employer.

AGU Congressional Science Fellowship. Individuals who are AGU members and U.S. residents are invited to apply for a 1-year assignment on the staff of a congressional committee or a House of Representatives. The fellowship is an honor on a wide range of scientific issues affecting public policy questions.

Applicants should have a broad background in science; be articulate, literate, and flexible and be able to work well with people from diverse professional backgrounds.

A public policy background is not required, although such experience and/or a demonstrated interest in applying science to the solution of public problems is desirable.

\$28,000 plus travel allowances.

How to apply: Applicants should submit a letter of intent, a curriculum vitae, and three letters of recommendation. The letter of intent should include a demonstration of why the fellowship is desired, how you will qualify for it, what issues and congressional situations interest you, what role you envision as a congressional staff member, and what outcome you hope for in relation to career goals. The individual must also request letters of recommendation should discuss your professional competence and other aspects of your background that make you particularly qualified to serve as a Congressional Science Fellow.

Send your application to: Department MP, Congressional Science Fellowship, American Geophysical Union, 3000 International Avenue, N.W., Washington, DC 20008.

Application deadline: March 31, 1984.

The University of Illinois is an Affirmative Action/Equal Opportunity Employer.

University of Washington/Paleontology/Paleobiology/Geochronology. The Department of Geology Sciences invites applications in the areas of paleontology/paleobiology, geochronology, and geochemistry (cosmic or isotopic geochemistry). We are interested in candidates who will establish exceptional and innovative research programs. Postdoctoral research experience is highly desirable. One position is available beginning September 1984. This is a tenure-track position at the rank of Assistant Professor or higher under exceptional circumstances. A second position may be available in September 1985. A paleontologist/paleobiologist may seek a joint appointment with the Burke Museum on campus. A successful candidate in either area will be expected to teach at both the undergraduate and graduate levels.

Applicants should send vitae and names of four references to John B. Adams, Chairman, Department of Geological Sciences, AJ-20, University of Washington, Seattle, Washington 98195. Closing date for applications is February 15, 1984. The University of Washington is an Affirmative Action/Equal Opportunity Employer.

University of Georgia/12-month tenure-track faculty position in the School of Forest Resources. Qualifications: Ph.D. in hydrology or forest hydrology with at least one degree in forest resources. Background should include forest resource management and quantitative analysis in the following areas: forest hydrology and watershed management. Develop a research program in an appropriate area of forest hydrology. Rank: Assistant Associate Professor, commensurate with qualifications. Salary: Commensurate with training and experience. Position available: July, 1984. Applications: All applications must be postmarked no later than February 1984. Submit resume, transcripts, and names of at least three references to:

Klaus Steinbeck, Chairman
Hydrology Search Committee
School of Forest Resources
University of Georgia
Athens, GA 30602
Telephone 404-542-1376

The University of Georgia is an Equal Opportunity/Affirmative Action Institution.

University of Washington/Faculty Position in Geophysics. The Geophysics Program at the University of Washington invites applications for a tenure-track position. The successful candidate will be expected to teach courses at the senior and graduate levels and to establish innovative, forward-looking research programs. Applicants with a Ph.D. and evidence of outstanding potential in basic research in any subfield of solid-earth geophysics will be considered. However, applicants with prime interest in studying global geophysics or in studying the physical properties of the earth's mantle and core will receive preference. Curriculum vitae and four letters of reference should be sent prior to 31 January 1984 to:

Professor Ronald T. Merrill
Chairman, Recruitment Committee
Geophysics Program
University of Washington
Seattle, Washington
Seattle, WA 98195

The University of Washington is an affirmative action/equal opportunity employer.

Minnesota Pollution Control Academy/Hydrologist. Applications are being accepted for a hydrologist position with the Minnesota Pollution Control Academy. The Academy is in the metropolitan Minneapolis-St. Paul area. Applicants must have a background in geology, hydrology or engineering with specific groundwater and/or experience in ground water hydrology. A Master's degree may be substituted for a portion of the experience rating. Experience in using and evaluating ground water models is desired. The position will include limited field work and contract supervision. For application information please contact:

Richard Nelson
Minnesota Pollution Control Agency
1915
St. Paul, Minnesota 55113
Telephone: (612) 296-7761

The State of Minnesota is an equal opportunity employer.

University of California, San Diego/Assistant Research Chemist. The Institute of Marine Research, University of California San Diego, announces an opening for an ASSISTANT RESEARCH CHEMIST (Salary range: \$22,900-\$26,800) in the Food Chain Research Group. The primary responsibility of the position is to carry out fundamental research in marine organic chemistry in association with other IMR chemists.

Applicants must have (a) a Ph.D. in organic chemistry, marine chemistry or chemical oceanography, and at least two years of post-doctoral experience in marine chemistry; (b) an ability to carry out independent research in the ocean as demonstrated by an active publication record in refereed journals; and (c) experience in work with modern sampling and analytical methods.

Send resume and names of three references by March 1, 1984, to:

Dr. Fred N. Spiess, Director
Institute of Marine Research, A-028
Scripps Institution of Oceanography
University of California San Diego
La Jolla, California 92093

The University of California San Diego is an equal opportunity/affirmative action employer.

University of California, San Diego/Assistant Research Chemist. The Institute of Marine Research, University of California San Diego, announces an opening for an ASSISTANT RESEARCH CHEMIST (Salary range: \$22,900-\$26,800) in the Food Chain Research Group. The primary responsibility of the position is to carry out fundamental research in marine organic chemistry in association with other IMR chemists.

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University of Iowa/Faculty Positions. The Department of Physics anticipates two openings for tenure-track assistant professors or visiting faculty at any level in August 1984. In exceptional cases a term or tenured appointment at the level of Associate Professor or higher will be considered. Preference for one position will be given to an experimentalist in intermediate or high energy nuclear physics. Current research interests in the department include nuclear structure and the following specialties in physics: atomic, condensed matter, elementary particle, laser, nuclear, plasma, and space physics. Faculty duties include undergraduate and graduate teaching, guidance of research students and personal research. Interested persons should submit a resume and a statement of research interests and arrange for three letters of recommendation to the Search Committee, Department of Physics and Astronomy, The University of Iowa, Iowa City, IA 52242.

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Send resume and names of three references by March 1, 1984, to:

Dr. Fred N. Spiess, Director
Institute of Marine Research, A-028
Scripps Institution of Oceanography
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University of Arizona/Postdoctoral Research Position in Planetary Atmospheres. Applications are invited for postdoctoral research positions at the Lunar and Planetary Laboratory, University of Arizona, Tucson, Arizona. The two positions will involve research in planetary physics and analysis of data from the Voyager mission. Research opportunities for these positions include the following: giant planets and their satellites, and ionospheres of the giant planets, the interstellar medium, the atmosphere and ionosphere of Venus, and planetary climate. Applicants should have a strong background in theory and data analysis. Physicists and astronomers are encouraged to apply. Curriculum vitae, bibliography and three letters of reference should be sent by March 1, 1984 to Dr. A. L. Broadfoot, Lunar and Planetary Laboratory, University of Arizona, 3625 E. Ajo Way, Tucson, Arizona 85713.

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cally be identified with the "active network" outside the normal active-region boundaries on the sun. Because of its broad spatial extent, this component would not have a large modulation by the solar rotation. The need for such a term is fairly obvious from the UV or HeII 10830 time sequences, but it is unknown (and fundamentally important for solar physics) whether or not this component can be physically distinguished from the evolution of active regions, including the ephemeral regions.

A major goal of the workshop was the identification of ground-based observations that could best provide the key solar synoptic data for the interpretation of all these phenomena. In the past, solar synoptic data have not enjoyed the glamour of a number of other branches of astronomy, and this has caused suffering both in terms of resources available and, at times, in quality of personnel. There have been many (probably unfair) references to 17th-century techniques for existing synoptic data, but all workshop participants would agree that improvements in type or quality of data are relatively easy to achieve.

This meeting report was prepared by Hugh S. Hudson, who is with the Center for Atmospheric and Space Sciences, University of California San Diego, La Jolla, CA 92093.

Large-Scale Snow Studies

A workshop on Large-Scale Snow Studies, sponsored by the IAHIS International Committee on Snow and Ice (ICSI) was held in Hamburg on August 26, 1983 to discuss a 1981 ICSI working group report on the subject, present several invited review papers, and obtain recommendations that would be considered for submission to ICSI. Albert Rango, U.S. correspondent for ICSI, was the workshop convener.

The consensus of opinion at the workshop was that continued research in remote sensing of snowpack properties should be supported; microwave research should point toward definition of the optimum set of sensors for spaceborne studies; and a comparison of the mapping of large-scale snow extent with

operational NOAA visible products and spaceborne microwave radiometers should be conducted.

ICSI should promote the idea of increased reporting of snow data to the appropriate World Data Centers (WDC) by member countries. There are few regular contributors of snow data to the centers whereas data on sea ice is reported much more regularly and in far greater quantity. Improved access to conventional snow data is mandatory for successful remote sensing studies. Furthermore, remote sensing data sets should be submitted to the WDC upon completion of analysis so that they will be available to other investigators. It was pointed out that the U.S. Air Force will launch another in their series of DMSP satellites in 2-3 years that will carry a multispectral microwave radiometer directly applicable to snow property mapping. ICSI should support the acquisition and archiving of these data so that they can be readily accessible for scientific investigation. This activity must be initiated soon in order to make effective use of the data when the satellite is launched.

The working group will continue to evaluate progress in this area and shall inform ICSI on the likelihood of conducting a symposium on large-scale effects of snow at either Budapest (1986) or Vancouver (1987). Such notice must be provided two years in advance.

This meeting report was contributed by Allen Rango, who is with the U.S. Department of Agriculture's Agricultural Research Service, Beltsville, MD 20715.

Future AGU Meetings

Fall Meetings
Dec. 3-7, 1984, San Francisco
(Abstracts due mid-September 1984)
Dec. 9-13, 1985, San Francisco
(Abstracts due mid-September 1985)

Ocean Sciences Meeting
Feb. 20-24, 1984, New Orleans

Spring Meetings
May 14-18, 1984, Cincinnati
(Abstracts due February 22, 1984)
May 27-31, 1985, Baltimore
(Abstracts due early March 1985)

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Aeronomy

0430 Composition (atomic or molecular): THE SOLARLY AVERAGED CIRCULATION, TEMPERATURE, AND VARIATIONS WITH GEOMAGNETIC ACTIVITY. R.C. Noble (National Center for Atmospheric Research, P.O. Box 3000, Boulder, Colorado 80502) and J.P. Stenflo.

A recently averaged chemical-dynamical model of the thermosphere is used to examine the effect of high-latitude particle and Joule heating on the neutral composition, temperature, and winds at solstices. The model is forced by solar ionization and by a parameterized Joule heating rate with a winter enhancement in Arctic regions. The model shows that the winter enhancement in Arctic regions is due to the solar-driven circulation in the thermosphere and to the effect of Joule heating on the neutral composition. The changes in wind and temperature are also examined. The model shows that the winter enhancement in Arctic regions is due to the solar-driven circulation in the thermosphere and to the effect of Joule heating on the neutral composition.

0430 Composition (atomic or molecular): THE GLOBAL DISTRIBUTION OF THERMOSPHERIC O₂ AND H₂O. R.C. Noble (National Center for Atmospheric Research, P.O. Box 3000, Boulder, Colorado 80502) and J.P. Stenflo.

A two-dimensional model of the minor neutral constituents in the thermosphere is used to examine the effect of high-latitude particle and Joule heating on the neutral composition, temperature, and winds at solstices. The model is forced by solar ionization and by a parameterized Joule heating rate with a winter enhancement in Arctic regions. The model shows that the winter enhancement in Arctic regions is due to the solar-driven circulation in the thermosphere and to the effect of Joule heating on the neutral composition.

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chemical model calculations of Roble and Kasting (1979). Transport of the minor neutral constituents by both the meridional and vertical circulation and vertical molecular and eddy diffusion are considered in the model. The calculated distributions of the minor neutral constituents for solar minimum only and for solar plus seasonal variation are compared. The results show that the minor neutral constituents are more abundant in the polar region than in the equatorial region. The calculated distribution of the minor neutral constituents for solar minimum only and for solar plus seasonal variation are compared. The results show that the minor neutral constituents are more abundant in the polar region than in the equatorial region.

0720 Electromagnetic Theory: DETERMINATION OF A VECTOR POTENTIAL. Thomas B. Senior and David A. Klemm (Department of Electrical Engineering, The University of Michigan, Ann Arbor MI 48106).

A vector potential is determined for a static field attributable to sources located on a perfectly conducting surface. With the use of the vector potential, the field for the construction of a radiation integral, and the field for the construction of a radiation integral, are developed in both cases. (Electromagnetic theory, scattering.)

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Journal of Geophysical Research
Volume 88 Number C15 December 20, 1983

Nonurban Troposphere Composition Symposium
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Marine Aerosol in Southern Mid-Latitudes (Paper 3C1348) G. P. Acheson and J. J. O'Brien 10,655
Measurement of Monoterpene Hydrocarbons at Niwot Ridge, Colorado (Paper 3C1344) J. L. Gras and G. P. Acheson 10,664
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Charge Separation During Bursting of Small Water Drops in Transient Flows: Shock Tube Measurements and Applications to Lightning (Paper 3C1331) D. Dryden and S. Trenka 10,993
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Polar Ice in Recent and Ancient Melts (Paper 3C1381) A. Kaufman, M. Maguerite, B. Peters, M. R. Goldsby, R. Kuhn, J. Gierke, W. Hering, M. Paul, and W. Bruns 11,003
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The resolutions passed at each quadrennial general assembly of IUGG and of its member associations are an important barometer of current opinion in the geophysics community and can be a powerful tool in the development of the scientific programs to which they are addressed. The resolutions will help advance programs, however, only if they are used. Carried back home by the national committees which make up the IUGG, the resolutions can spread information worldwide on programs that promise to most effectively advance geophysical knowledge. IUGG and its member associations intend that member groups will present the resolutions before decision makers aware of international scientific thought.

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